

# PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

(Large Entity)

Docket No.

4488

In Re Application Of: Chen et al.

JUN 07 2006

Application No.

09/804,328

Filing Date

March 12, 2001

Examiner

Edward M. Johnson

Customer No.

48226

Group Art Unit

1754

Confirmation No.

Invention: Selective Catalytic Reduction of N2O

## COMMISSIONER FOR PATENTS:

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a response to the Office Action of March 7, 2006 above-identified application.  
Date

The requested extension is as follows (check time period desired):

☒ One month ☐ Two months ☐ Three months ☐ Four months ☐ Five months

from: May 7, 2006

Date

until: June 7, 2006

Date

The fee for the extension of time is \$120 and is to be paid as follows:

- ☐ A check in the amount of the fee is enclosed.
- ☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. 05-1070
- ☒ If an additional extension of time is required, please consider this a petition therefor and charge any additional fees which may be required to Deposit Account No. 05-1070
- ☐ Payment by credit card. Form PTO-2038 is attached.

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

  
Signature

Dated: June 5, 2006

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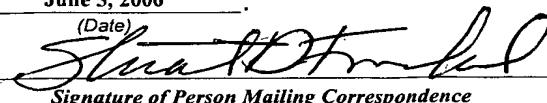
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CC:

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on

June 5, 2006

(Date)

  
Signature of Person Mailing Correspondence

Stuart D. Frenkel

Typed or Printed Name of Person Mailing Correspondence



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Chen et al.	Group Art Unit: 1754
Serial No.: 09/804,328	Examiner: Edward M. Johnson
Filed: March 12, 2001	
Title: <i>Selective Catalytic Reduction of N<sub>2</sub>O</i>	Atty. Docket No. 4488

5 Commissioner of Patents  
and Trademarks  
PO Box 1450  
Alexandria, VA 22313-1450

10 APPEAL BRIEF

Real Party Of Interest

The real party of interest in this case is Engelhard Corporation.

15

Related Appeals And Interferences

There are no appeals or interferences known to be related to or have a bearing on the Board's decision in the pending appeal.

20

Status Of Claims

Claims 3, 5-7, 10-14 and 18 are pending and have been Finally Rejected. These Finally Rejected claims form the basis of this appeal. Claims 1, 2, 4, 8, 9, 15-17, and 19-  
25 24 have been canceled.

### Status Of Amendments

5 A response to the Final Rejection under 37 CFR 1.116 without amendment was  
filed on January 31, 2006. By advisory action dated February 13, 2006, the request for  
reconsideration was considered but did not place the application in condition for  
allowance.

### Summary Of Claimed Subject Matter

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The presently claimed invention is directed to the selective catalytic reduction of  
NO<sub>x</sub> to achieve simultaneous removal of NO<sub>x</sub> and N<sub>2</sub>O from a single process stream,  
page 6, lines 26-29. The inventive simultaneous removal of NO<sub>x</sub> and N<sub>2</sub>O in a single  
process stream is achieved by introducing ammonia into the process stream upstream of a  
15 catalyst bed. In accordance with this invention, the gas stream containing both NO<sub>x</sub> and  
N<sub>2</sub>O is passed in contact with a beta zeolite, page 7, lines 1-9.

Page 11, line 25 through page 12, line 4 discusses that the zeolite beta catalyst  
was unable to provide NO<sub>x</sub> conversion in a gas containing both NO<sub>x</sub> and N<sub>2</sub>O without  
20 the addition of ammonia (Figure 7), but by introducing ammonia into the gas stream  
containing both NO<sub>x</sub> and N<sub>2</sub>O, conversions of both these nitrogen compounds over  
zeolite beta were increased substantially.

### 25 Ground Of Rejection To Be Reviewed On Appeal

1. Claims 3, 10-14 and 18 have been Finally Rejected under 35 USC 103 (a) as  
being unpatentable over Riley et al. (US 5,200,162) in view of Fetzer (US 6,056,928).  
The Examiner states that Riley discloses a process for nitrous oxide decomposition  
30 comprising contacting a nitrous oxide and NO<sub>x</sub> stream with ammonia and zeolite. The

Examiner recognizes that Riley fails to disclose beta zeolite for the simultaneous reduction of the nitrogen compounds. The Examiner applies Fetzer as disclosing a beta zeolite and concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the beta zeolite of Fetzer selective for simultaneous reduction in the process of Riley. The Examiner also states that Riley discloses a temperature of reaction of 150-550 °C and discloses iron-exchanged zeolites.

2. Claims 3, 5-7, 10-14 and 18 have been Finally Rejected under 35 USC 103 (a) as being unpatentable over Kato et al. (US 4,571,329) in view of Fetzer as mentioned above. The Examiner applies Kato as disclosing a process for ammonia reduction of nitrous oxide comprising contacting a nitrous oxide containing gas with ammonia and zeolite and discloses removal of NO<sub>x</sub> and N<sub>2</sub>O. The Examiner admits that Kato fails to disclose beta zeolite selective for the simultaneous reduction of the nitrogen compounds. Fetzer is applied as previously as disclosing a beta zeolite. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the beta zeolite of Fetzer in the nitrous oxide decomposition process of Kato. The Examiner states that Kato discloses a temperature of reaction of 300-500 °C and an iron-exchanged zeolite.

3. Claims 3, 10-11, and 18 have been Finally Rejected under 35 USC 103 (a) as being unpatentable over Tsuchitani et al. (US 5,756,057) in view of Fetzer as mentioned above. The Examiner states that Tsuchitani discloses a method for removal of NO<sub>x</sub> comprising contacting a stream containing N<sub>2</sub>O with a reducing agent such as ammonia and a catalyst comprising a zeolite. The Examiner admits that Tsuchitani fails to disclose beta zeolite. Fetzer is applied as previously as disclosing a beta zeolite. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the beta zeolite of Fetzer in the nitrous oxide decomposition process of Tsuchitani et al.

## Argument

1. With respect to the rejection based on the combination of Riley in view of Fetzer, it is Appellants position that the applied references in combination do not suggest or render obvious the claimed process and in particular, do not suggest that a beta zeolite could be effective for the simultaneous reduction of  $N_2O$  and  $NO_x$  in a gas stream further containing ammonia.

First, Riley is concerned with the decomposition of  $N_2O$  in a gas stream and not the simultaneous decomposition of  $N_2O$  and  $NO_x$ . In fact, the Abstract of Riley states that when the  $N_2O$  containing gas stream also contains  $NO_x$ , it is “often highly desirable to pretreat the stream to remove  $NO_x$  prior to the  $N_2O$ -decomposition zone.” Further, column 3, lines 45-50 of Riley states that when the gas stream contains other oxides of nitrogens such as  $NO_x$ , the process “may need to be modified to remove  $NO_x$  prior to the  $N_2O$  decomposition zone.”

In Riley, the  $N_2O$ -containing feedstock is passed into a decomposition zone containing a solid catalyst. The solid catalyst can be a variety of materials including zeolites, column 4, lines 34-39. The types of zeolites are disclosed at column 5, lines 5-24. Zeolite beta is not disclosed. In column 8, lines 25-59, Riley discloses the need to remove  $NO_x$  prior to his process of decomposing  $N_2O$ . Riley states in the mentioned passage that “the effectiveness of many catalyst for  $N_2O$  decomposition is significantly impaired by  $NO_x$ .” In the same mentioned passage, Riley states “the presence of  $NO_x$  in the  $N_2O$ -containing feed gas is detrimental. In theses cases it is highly desirable to remove  $NO_x$  in a zone prior to the  $N_2O$  decomposition zone.” Riley then discloses methods which can remove the  $NO_x$  prior to the decomposition of the  $N_2O$  stream including the selective reduction of  $NO_x$  with ammonia in the presence of oxygen and catalyzed by precious metals. Clearly, Riley does not teach nor suggest the use of any catalyst which is selective for the “simultaneous reduction of  $N_2O$  and  $NO_x$ ” as claimed let alone the use of beta zeolite.

The secondary reference to Fetzer is directed to a multistage process for removing nitrogen oxides from a gas stream. Fetzer neither discloses simultaneous removal of N<sub>2</sub>O and NO<sub>x</sub> from a gas stream nor suggest that zeolite beta can be used to catalyze the ammonia-mediated reduction of these nitrogen oxides. Fetzer discloses a three-stage process. In Stage A adsorption of nitrogen oxides other than N<sub>2</sub>O is achieved such as by the use of water, column 2, lines 43-48. In Stage B, the amount of N<sub>2</sub>O is reduced by the use of a heterogeneous catalyst. Among examples of catalysts used is zeolite beta, column 4, line 15. The zeolite catalyst may be exchanged with various metals, column 4, lines 20-21. In a preferred embodiment, a Stage C is used in which the gas stream from Stages A and B can be passed through Stage C for reducing nitrogen oxides other than N<sub>2</sub>O. In Stage C the gas stream can be reacted by means of selective catalytic reduction (SCR) in which the nitrogen oxides are reacted with ammonia. The catalysts for the SCR reaction are set forth at column 4, lines 47-57. Zeolite beta is not disclosed for Stage C.

Accordingly, the secondary reference does not teach the simultaneous reduction of N<sub>2</sub>O and NO<sub>x</sub>. The secondary reference does not suggest use of zeolite beta in a reaction with ammonia. At best, Fetzer discloses in Stage B the use of beta zeolite for reducing the amount of N<sub>2</sub>O in the absence of ammonia. Thus, it is Appellant's position that even the substitution of beta zeolite in the process of Riley does not meet the claimed process which is directed to the simultaneous reduction of N<sub>2</sub>O and NO<sub>x</sub>. Riley separately converts NO<sub>x</sub> and N<sub>2</sub>O. The patent recites that it is highly desirable to remove NO<sub>x</sub> prior to the N<sub>2</sub>O decomposition zone. Fetzer does not make up for this deficiency of Riley. Moreover, Fetzer does not suggest that beta zeolite can be used to reduce either N<sub>2</sub>O or NO<sub>x</sub> in the presence of ammonia. In fact, Fetzer uses beta zeolite without ammonia. Accordingly, the combination of Riley with Fetzer does not suggest the effective simultaneous reduction of N<sub>2</sub>O and NO<sub>x</sub> with ammonia using zeolite beta.

The Examiner in maintaining the rejection of Riley in view of Fetzer has stated that the applicant's arguments are not persuasive because it would have been within the

purview of an ordinary artisan not to add a step of removing catalyst between Stages B and C of Fetzer since no such step is disclosed. These arguments are not at all understood. There is no physical reason why the catalyst of Fetzer would be transferred from Stage B to Stage C. The Fetzer process involves a gas stream which flows through the bed of catalyst. The catalyst remains in the bed while the gas stream would then be directed to an additional stage. Accordingly, there would be no beta zeolite from Stage B of Fetzer introduced into Stage C. It is the gas stream which would be directed from Stage B to Stage C, not the catalyst. Again, Fetzer merely discloses the use of beta zeolite for reducing  $N_2O$  in the absence of ammonia. The combination of Riley and Fetzer does not remotely suggest the process of the claimed invention in which both  $N_2O$  and  $NO_x$  are simultaneously reduced in the presence of beta zeolite and ammonia.

2. It is further Appellant's position that the rejection based on the combination of Kato et al. in view of Fetzer is not proper. Kato discloses in column 5, lines 18-56, the ammonia reduction of  $NO_2$  employing a reactor having filled a large amount of catalyst which is active to both the reaction of  $NO_2$  with ammonia and the ammonia reduction reaction of  $N_2O$ . The reaction takes place in the presence of a zeolite catalyst such as an H or Fe substituted zeolite catalyst such as mordenite, zeolite Y, and the other zeolites disclosed in column 4, lines 43-49. Zeolite beta is not disclosed.

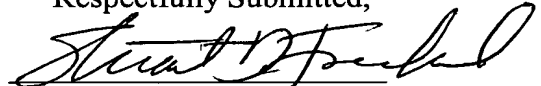
It is believed that the Examiner's reliance upon Fetzer as discussed above to disclose the use of beta zeolite for the reaction in Kato is improper. As stated above, Fetzer is not concerned with the ammonia reduction of  $N_2O$  in the presence of beta zeolite. It is the Appellants who have discovered that zeolite beta can be effectively used for the simultaneous reduction of  $NO_x$  and  $N_2O$  with ammonia. Neither Kato et al. which does not disclose zeolite beta nor Fetzer which discloses zeolite beta but not in a reaction which involves ammonia suggest or render obvious what Appellants have found. The Board is kindly invited to Figure 8 of the present application and the discussion thereof on page 11, line 25 through page 12, line 4. The results as disclosed therein are not suggested by the combination of references.

3. It is believed that the rejection based on the combination of Tsuchitani et al. in view of Fetzer is improper. Appellants point out that Tsuchitani et al. is not concerned with the simultaneous reduction of NO<sub>x</sub> and N<sub>2</sub>O. Tsuchitani discloses a first step of oxidizing nitrogen oxides such as NO, N<sub>2</sub>O, etc. which are present at high proportions in the NO<sub>x</sub> components of an exhaust gas into NO<sub>2</sub>. The NO<sub>2</sub> thus resulting from the oxidation step is then adsorbed on a component possessing NO<sub>2</sub> adsorbing ability. By introducing a reducing substance such as ammonia instantaneously into the exhaust gas enveloping the NO<sub>x</sub> accumulated on the adsorbent component, the adsorbed NO<sub>x</sub> is reduced or decomposed, column 4, lines 32-46. Thus, it is uncertain whether the gas which is treated with ammonia in Tsuchitani contains N<sub>2</sub>O since it is the purpose of the reference to initially convert NO or N<sub>2</sub>O, etc. to NO<sub>2</sub>. The only disclosure of a zeolite used in the primary reference appears to be Example 21 where ZSM-5 is utilized. However, the primary reference does not suggest simultaneous reduction of NO<sub>x</sub> and N<sub>2</sub>O with ammonia as set forth in the claims. Accordingly, even if Fetzer were combinable with the primary reference, the combination would not teach or render obvious the claimed process. Again, as stated above, Fetzer is not concerned with the use of beta zeolite to reduce N<sub>2</sub>O in the presence of ammonia. It is the Appellants who have found that zeolite beta is particularly useful for the simultaneous reduction of NO<sub>x</sub> and N<sub>2</sub>O with ammonia.

It is respectfully requested that the Final Rejection of claims 3, 5-7, 10-14, and 18 be reversed.

Date 6/5/2006

Respectfully Submitted,



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## CLAIMS APPENDIX

3. A method as recited in claim 18, wherein the gas stream has a temperature of from  
5 about 350°C to about 600°C.
5. A method as recited in claim 18, wherein the ammonia/N<sub>2</sub>O concentration ratio is up to  
about 2.0 based on the total volume of the gas stream.
- 10 6. A method as recited in claim 18, wherein the ammonia/N<sub>2</sub>O concentration ratio is at  
least about 0.5 based on the total volume of the gas stream.
7. A method as recited in claim 18, wherein the ammonia/N<sub>2</sub>O concentration ratio is from  
about 0.8 to about 1.0 based on the total volume of the gas stream.
- 15 10. A method as recited in claim 18, wherein the zeolite is ion-exchanged with at least  
one type of ion selected from the group consisting of Fe, Cu, Co, Ce, Pt, Rh, Pd, Ir, Mg  
and combinations thereof.
- 20 11. A method as recited in claim 18, wherein the zeolite is ion-exchanged with at least one  
type of ion selected from the group consisting of Fe, Ce, Cu, Co and combinations  
thereof.
12. A method as recited in claim 18, wherein the N<sub>2</sub>O concentration of the gas stream is  
25 about 1% or less.
13. A method as recited in claim 18, wherein the N<sub>2</sub>O concentration of the gas stream is  
about 5,000 ppm or less.
- 30 14. A method as recited in claim 18, wherein the N<sub>2</sub>O concentration of the gas stream is  
between about 20 ppm and about 5,000 ppm.

18. A method for ammonia-mediated  $\text{N}_2\text{O}$  and  $\text{NO}_x$  reduction, comprising contacting a gas stream containing  $\text{N}_2\text{O}$  and  $\text{NO}_x$  with ammonia and a catalyst comprising a BETA zeolite which is selective for the simultaneous reduction of  $\text{N}_2\text{O}$  and  $\text{NO}_x$ , wherein the gas stream containing ammonia, nitrous oxide and nitrous oxide and has a temperature of greater than about  $250^\circ\text{C}$ .
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## EVIDENCE APPENDIX

No evidence submitted.



RELATED PROCEEDINGS APPENDIX

Not applicable.